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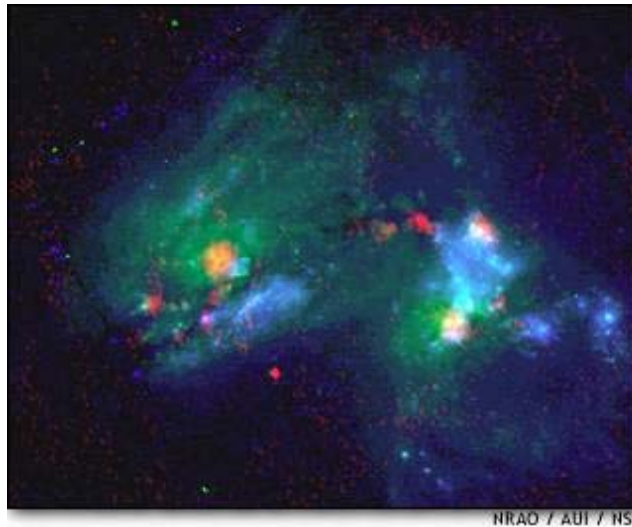
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Scientists witness supernova factory

Work aids understanding of early universe

Multiwavelength image of the colliding-galaxy pair Arp 299 using data from the VLA and Hubble Space Telescope. Here, radio emission is shown as red, infrared as green, and ultraviolet as blue.



NRAO / AUI / NSF

By Robert Roy Britt
SPACE.COM

NASHVILLE, May 27 — Astronomers have peered through a secretive cloak of dust to find five exploded stars in a region of space believed to be among the most energetic in the universe. They're calling it a supernova factory, the first of its kind ever witnessed.

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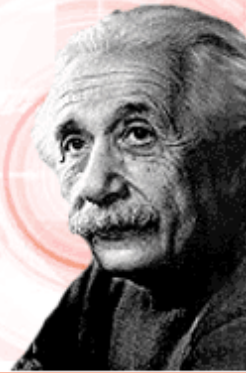
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THE SUPERNOVAE, forged at the intersection of two merging galaxies, help confirm a long-held theoretical expectation that galaxy collisions generate episodes of intense star birth and rapid death. Astronomers call these merging objects starbirth galaxies, and they are thought to be a primary driving force of cosmic evolution.

The work represents an initial step toward a better understanding of the early universe, when galaxy mergers were common, the birth of stars occurred frenetically in cramped spaces and explosive deaths were the norm, researchers said.

The results were presented here today at the 202nd meeting of the American Astronomical Society.

JUST EXPLODED

One of the newfound supernovae only recently exploded and was only spotted weeks ago. It did not show up in observations made last year.

"This supernova is likely to be part of a group of super star clusters that produce an average of one such stellar explosion every two years," said James Ulvestad of the National Radio Astronomy Observatory.



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Normal galaxies like our Milky Way typically produce supernovae no more often than once a century.

Ulvestad and his colleagues used a giant array of radio telescopes, which peer through thick

Required

dust that surrounds
the scene and renders
traditional telescopes

ineffective. He likened the effort to trying to detect sunlight through a brick. The technique is expected to lead to several similar findings in other suspected starburst galaxies.

The five supernovae are all within 350 light-years of one another in the merging galaxy, called Arp 229. Two of them are just 7 light-years apart.

“Arp 229 is an excellent time machine for looking at the early universe,” said Susan Neff of NASA’s Goddard Space Flight Center. She said there are probably more supernova in the region that have yet to be detected.

ABOUT SUPERNOVAE

Supernova events are the incendiary deaths of huge stars several times as massive as the Sun. They use up their nuclear fuel quickly, in just a few million years, and gravity pulls remaining material rapidly inward.

Upon collapse, a dying star’s core rebounds to generate a shock wave that blasts its outer layers into space. For a moment, it can shine as bright as a 100 billion suns.

The first stars in the universe were very massive and made almost entirely of hydrogen with some helium. They were the first chemical factories, forging new elements — heavier with each generation — that were cast into space when the stars exploded. Subsequent generations of stars formed from this detritus.

More modern stars, like are Sun, are the beneficiaries of stellar evolution, containing an abundance of heavier elements.

The very ingredients for life were created in supernova, astronomers like to say.

CONFIRMING EXPECTATIONS

Supernova discoveries are common nowadays. But most of those spotted are pretty boring, Ulvestad said, because they occur in relative isolation. In Arp 299, things are so crowded that the explosion is confined. So the supernova are smaller than most and pack more power into their confined punch.

More refined observations will be needed to figure out what that means.

Meanwhile, the new findings are the first to involve a supernova factory that resembles those suspected in the earliest epochs of the cosmos, said Cornell University’s Daniel Weedman, who was not involved in the research.

“It confirms the concept of starburst,” Weedman said, adding that the majority of all the universe’s

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energy comes from starburst galaxies. Other researchers are eager to learn how starburst activity relates to black hole mergers and overall galaxy formation.

Weedman cautioned that modern galaxies like Arp 299, and the stars that develop in them, may experience different physical, chemical and environmental conditions compared to similar structures in the early universe. So it is not clear, he said, how useful the apparent window to the past will prove to be. More observations and theoretical advances will be needed. But he said the window represents a very important first step.

The discoveries were made with two National Science Foundation observatories, the Robert C. Byrd Green Bank Telescope and the Very Long Baseline Array, which combines the efforts of 10 antennas spread from Hawaii to the Virgin Islands to gain greater sensitivity.

The colliding galaxies of Arp 299 are about 140 million light-years from our planet, so the activity recently observed from Earth actually took place 140 million years ago, its light having just arrived here.

Previously, optical observations had detected four other supernovae in Arp 299 over the past 13 years, but each sat around the outskirts of the obscuring dust clouds, so astronomers had not known what really went on at the heart of the action.

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